

We claim:

1. Apparatus for forming linerless labels from web made of material having a release side and a pressure sensitive adhesive side, which comprises:

means for feeding web along a flow path to a cutter assembly;

a cutter assembly, for cutting the web repetitively, to form labels; and,

means for receiving said labels from the cutter assembly;

wherein, the web is contoured in a plane transverse to the flow path, prior to being cut by the cutter assembly.

2. The apparatus of claim 1, wherein said means for receiving labels transports the labels away from the cutter assembly along a continuation of said flow path.

3. The apparatus of claim 2, wherein the labels are contoured in a plane transverse to said flow path while being transported.

4. The apparatus of claim 2 further comprising: a source of web in roll form; and, means for delivering web from the roll to the upstream end of the means for feeding web along a free loop path.

5. The apparatus of claim 3, wherein the contour of web and labels is concave when viewed from the release side of the linerless label material.

6. The apparatus of claim 1 wherein said means for feeding comprises at least three spaced apart endless belts, for contacting and moving contoured web downstream along said flow path, one of said

three belts having a transverse plane elevation different from the elevation of the other two belts at some point along the flow path.

7. The apparatus of claim 5 wherein said feeding means comprises one or more endless belts running between spaced apart rollers; wherein, one belt contacts the lengthwise center of the adhesive side of the web without contacting lengthwise regions adjacent to the center.

8. The apparatus of claim 7 wherein the elevation of said one belt changes progressively from equal elevation at the upstream end to unequal elevation at the downstream end of the means for feeding, to progressively contour the web as it moves downstream.

9. The apparatus of claim 1 wherein said means for receiving and transporting labels comprises at least three spaced apart endless belts running around spaced apart rollers, wherein one belt has a transverse plane elevation different from the elevation of the other two belts, so that labels cut from said contoured web are transported down the flow path in contoured condition.

10. The apparatus of claim 7 or 9 wherein said belts move around a downstream end roller having a diameter sufficient to cause stretching of the outer fiber of the belts, and to thereby create breakaway strain on an adhesive bond between the belts and a web being moved along the flow path.

11. The apparatus of claim 1 wherein said means for feeding further comprises:

an upstream roller and a downstream roller; and

an endless profile belt running around said rollers, for contacting said adhesive side of the web, to thereby move the web along said flow path;

wherein said profile belt comprises a belt base having a central land and spaced apart opposing side wings, all running along the length of the endless belt base and projecting outward from the base.

12. The apparatus of claim 11 wherein the wings are continuous, so that when the belt contacts and runs around the surfaces of said rollers during use, the wings flatten toward the belt base.

13. The apparatus of claims 7 of 9, further comprising: means for pressing one or more portions of the release side of the web toward at least one belt, as the belt moves downstream with the web.

14. The apparatus of claim 11 further comprising: means for pressing the lengthwise center portion of the web of the release side of the web toward the profile belt where it contacts the lengthwise center portion of the web.

15. The apparatus of claim 14 wherein the means for pressing is a pinch roller having a width greater than the width of the central land of the belt.

16. The apparatus of claim 1 wherein said means for feeding comprises:

an upstream roller and a downstream roller;

an endless belt running around the rollers, for contacting the adhesive side of the web, to thereby move the web along said flow path;

wherein at least one roller has spaced apart circumferential rings on either side of the roller region upon which the belt runs, the rings having outside diameters greater than the outside diameter of the surface of the belt, where it runs around said roller.

17. Apparatus for forming linerless labels from material in web form, the material having a release side and a pressure sensitive adhesive side, which comprises:

a cutter assembly, lying along a material flow path, for forming labels by cutting of web, which comprises a rotatable cylinder with a knife and an opposing rotatable anvil, wherein there is a gap between the said cylinder and anvil, when the knife is rotated away from proximity to the anvil;

means for feeding web along the flow path toward the cutter assembly, said means contouring the web in a plane transverse to the flow path and moving the contoured web into and through the cutter gap; and,

means for receiving the end of web which is moved into and through the gap prior to cutting of the web, for transporting labels cut from the web along the flow path, away from the cutter assembly, and for delivering the labels to articles for attachment thereto.

18. The apparatus of claim 17 wherein the linear velocities of labels being transported away from the cutter assembly is greater than the linear velocity of web being moved into the gap of the cutter assembly.

19. The apparatus of claim 18 wherein the cutter assembly cuts partially through the web material; and wherein the means for receiving pulls on the web material to tear the remaining material in vicinity of the where the web cut was made, and thereby form the label.

20. The apparatus of claim 18 wherein the cutter knife contacts the release side of web material.

21. The apparatus of claim 17 wherein said feeding means comprises at least three spaced apart endless belts running around spaced apart rollers; wherein, during use the center endless belt contacts a lengthwise center portion of the adhesive side of the web and each of the other belts contacts a lengthwise portion of the adhesive side of the web which portion is spaced apart from said center portion; wherein said contacting comprises temporary bonding of said pressure sensitive adhesive to the belts.

22. The apparatus of claim 17 wherein said means for feeding comprises an endless belt running around spaced apart rollers, the belt having a belt base, and a central land and spaced apart opposing side wings, all running along the length of the endless base and projecting outward from the base; wherein, when the belt contacts and runs around the surfaces of said rollers during use, the wings flatten toward the belt base.

23. The apparatus of claim 1 wherein the cutter assembly comprises: a rotatable knife; an opposing rotatable anvil; and, means for cooling the anvil.

24. The apparatus of claim 1 wherein the cutter assembly comprises: a rotatable knife cylinder with knife; an opposing rotatable cylindrical anvil in contact with the knife cylinder; and, means for resiliently pressing together the knife cylinder and the anvil, so that cylindrical rotation of either rotates the other by frictional engagement therebetween.

25. The apparatus of claim 24 wherein the surface of the anvil which mates with the knife during cutting has a circumference different from the circumference of the path of the tip of the knife, so that the knife tip mates with a different circumferential part of the anvil each time the knife cylinder is fully rotated.

26. Apparatus for forming linerless labels from material in web form, the material having a release side and a pressure sensitive adhesive side, which comprises:

means for feeding said web along a flow path toward a cutter assembly; and,

a cutter assembly, for cutting portions from the web to form labels, which comprises a rotatable knife and a rotatable anvil having means for interior cooling.

27. Apparatus for forming labels from web comprising:

a source of label material in web form, the web having spaced apart indicia which are readable by a sensor;

means for feeding said web along a flow path toward a means for cutting;

means for cutting said web to form labels;

means for receiving said labels from the cutter assembly;

a first sensor, positioned downstream of the cutting means, for reading indicia lengths;

means for comparing lengths of portions of an indicium which is severed during forming of a label, based on first sensor reading information; and,

means for adjusting the length of a subsequent label, according to how the lengths of the indicium portions relate to each other or to a desired reference standard.

28. Apparatus for forming labels from web comprising:

a source of label material in web form, the web having two spaced apart staggered sets of indicia which are readable by a sensor, the degree of stagger sufficient to provide lengthwise spaces  $S$  on the web between indicia pairs of each set;

means for feeding said web along a flow path toward a means for cutting;

means for cutting said web to form labels;

means for receiving said labels from the cutter assembly;

a first sensor, positioned downstream of the cutting means, for reading indicia lengths;

wherein said first sensor reads the presence or absence of whole indicia on a label or web end just-formed by cutting of said web; and,

means for adjusting the length of the web which is subsequently cut, according to whether not the first sensor detects any indicium has been cut.

29. The apparatus of claim 27 or 28 wherein the means for adjusting comprises changing the amount of web which is fed along the flow path prior to cutting of a label.

30. The apparatus of claim 27 or 28 wherein the means for cutting comprises a rotary knife cylinder and mating anvil; and, wherein the means for adjusting comprises changing the speed or timing of rotation of the knife cylinder.

31. The apparatus of claim 27 wherein the label length is changed according to whether or not there is equality in length of portions of any severed indicium.

32. In apparatus which feeds web into and through the gap of a cutter, so the cutter can form labels by cutting portions from the web which cantilevers from the end of a feeder through said gap, the improvement which comprises: contouring the web in a plane transverse to said flow path, to increase the stiffness of the cantilevered web.

33. The apparatus of claim 32 further comprising: means for receiving and transporting away said labels, wherein the web cantilevers sufficiently through the cutter gap to be received and transported away after cutting and formation of a label.

34. A method of forming linerless labels from web made of material having a release side and a pressure sensitive adhesive side, and applying said labels to articles, which comprises:

feeding web along a flow path toward a cutter, so the web extends through and beyond the cutter, while

contouring the extended web cutter in a plane transverse to the flow path, to provide stiffness to the web;

repetitively cutting the extended web, for forming labels;

receiving and transporting said labels further along the flow path, away from the cutter and toward articles to be labeled, while the labels are contoured in a plane transverse to the flow path; and,

projecting the ends of said contoured labels from the downstream end of the means which receives and transports labels, so the ends of thereof contact and adhere to moving articles.

35. The method of claim 34 wherein web is partially cut through in the cutting step; and wherein the receiving and transporting step causes the remainder of the web to tear, to thereby form the label.

36. The method of claim 34 which comprises using of one or more endless belts for feeding the web by removably bonding the adhesive side of the web to one or more of said belts.

37. The method of claim 35 which further comprises: removing portions of the edge of the web prior to feeding the web to create spaced apart cutouts along at least one edge; cutting the web with the cutter so that each cut intersects a cutout, to thereby form labels with ends which have shapes in part determined by the shape of the cutout and in part by the cut made by the cutter.

38. A method of applying linerless labels to articles which comprises contouring a label so the release side of the label contoured and made concave; projecting an end of the concaved label toward an article, so the label end contacts and adheres to the article; and, releasing the label from the means which projected the label toward the article; and, adhering the rest of the label to the article.